

INTERSTATE COMMERCE COMMISSION

WASHINGTON

INVESTIGATION NO. 2656

THE CHICAGO & NORTH WESTERN RAILWAY COMPANY

REPORT IN RE ACCIDENT

NEAR COLLETT, ILLINOIS, IOWA, ON

OCTOBER 23, 1942

SUMMARY

Railroad	Chicago & North Western
Date	October 23, 1942
Location.	Council Bluffs, Iowa
Kind of accident	Rear-end collision
Trains involved	Freight Express-mail
Train numbers	Tetra 4006 West 5
Engine numbers	4006 1637-2906
Consist	49 cars, caboose 7 cars
Speed	15-18 m. p. h. 60 m. p. h.
Operation	Timetable, train orders and automatic train-control system
Track	Double 2 nd curve, level
Weather	Clear
Time	9:55 a. m.
Casualties	11 injured
Findings	Cause of accident, failure of auto- matic train-control system to function as intended, operating rules not being enforced and obeyed
Recommendations	Wayside signals be installed in connec- tion with automatic train control system, cab signals conforming to specifications and requirements pre- scribed by Commission's order of April 16, 1939, be installed on locomotives of this carrier in con- nection with automatic train-control system, operating rules be enforced and obeyed

INTERSTATE COMMERCE COMMISSION

INVESTIGATION NO. 2639

IN THE MATTER OF MAKING ACCIDENT INVESTIGATION REPORTS
UNDER THE ACCIDENT REPORTS ACT OF MAY 6, 1910

THE CHICAGO & NORTH WESTERN RAILWAY COMPANY

March 12, 1943.

Accident near Council Bluffs, Iowa, on October 23, 1942,
found to be caused by failure of the automatic
train-control system to function as intended; oper-
ating rules not being enforced and obeyed.

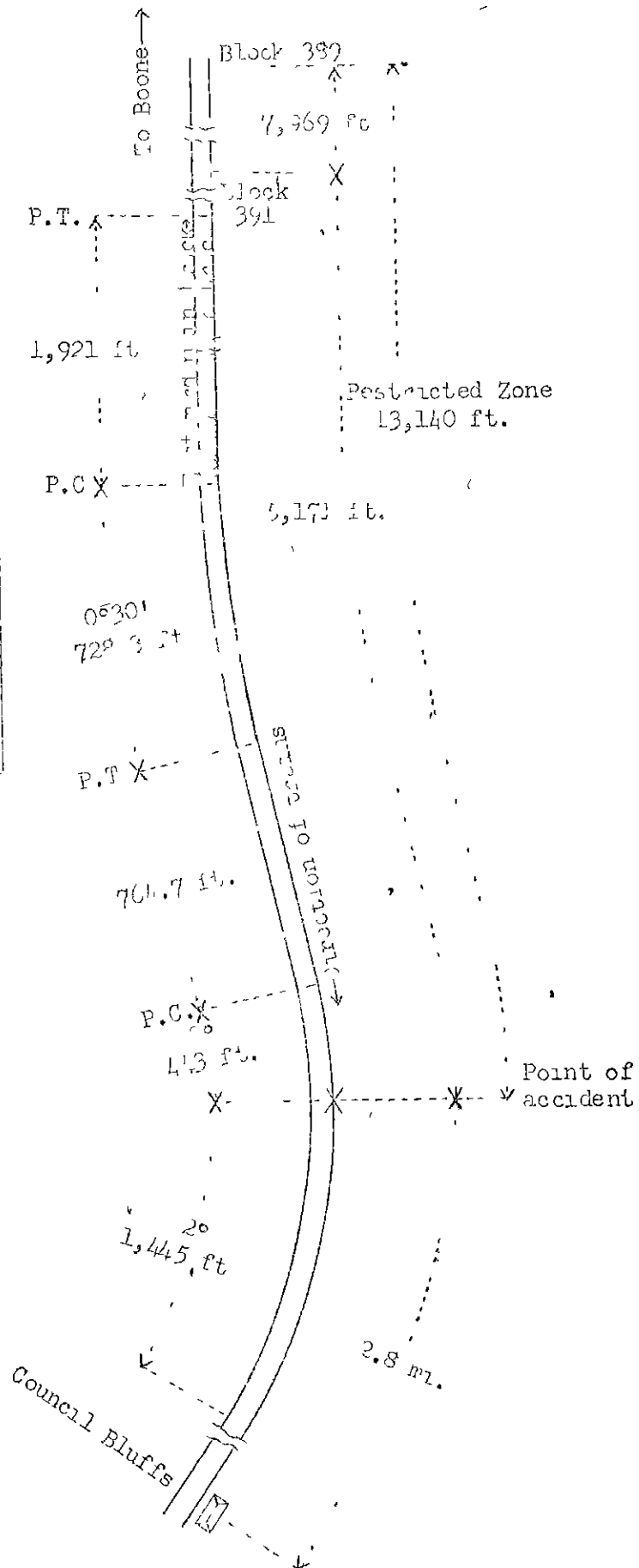
REPORT OF THE COMMISSION¹

PATTERSON, Commissioner.

On October 23, 1942, there was a rear-end collision between a freight train and an express-mail train on the Chicago & North Western Railway near Council Bluffs, Iowa, which resulted in the injury of 6 railway-mail clerks, 2 express messengers and 3 train-service employees. This accident was investigated in conjunction with a representative of the Iowa State Commerce Commission.

¹Under authority of section 17 (2) of the Interstate Commerce Act the above-entitled proceeding was referred by the Commission to Commissioner Patterson for consideration and disposition.

- | | |
|---|----------------------|
| o | Boone, Iowa |
| | 123.7 mi |
| o | Frederick Valley |
| | 18.6 mi |
| X | Point of accident |
| | 2.1 mi |
| o | Freight Yard |
| | 0.7 mi |
| o | Council Bluffs, Iowa |



Inv. No. 2639
Chicago & North Western Railway
Council Bluffs, Iowa
October 2, 1942

Location of Accident and Method of Operation

This accident occurred on that part of the Iowa Division designated as Subdivision 3 and extending between Boone and Council Bluffs, Iowa, 146.1 miles. In the vicinity of the point of accident this is a double-track line over which trains are operated by timetable, train orders and an automatic train-control system. The accident occurred on the westward main track at a point 2.8 miles east of the station at Council Bluffs. Approaching from the east there are, in succession, a tangent 1,921 feet in length, a $6^{\circ}30'$ curve to the left 728.3 feet, a tangent 764.7 feet and a 2° curve to the right 445 feet to the point of accident and 1,445 feet beyond. At the point of accident the grade is level.

The automatic train-control system is of the continuous-inductive type, and each engine is equipped with an arrangement of audible and visual indicators. There are no wayside signals except at interlockings. The track is divided into blocks, in the same manner as where wayside automatic signals are used. The system is so arranged that when a block is occupied there is a restricted zone extending from a point at least stopping distance in approach of the entrance to the occupied block to the point of obstruction. When an engine enters this restricted zone the visual indicator changes from green to red-over-yellow, the speed-control mechanism starts to function, then an audible speed-indicator and an audible acknowledging indicator sound, and, regardless of the speed at which the train is operating, an automatic brake application will occur unless the engineer operates an acknowledging lever. If the speed is above the maximum low-speed limit of 23 miles per hour, the engineer, in addition to acknowledging properly, must reduce the speed to the low-speed limit within a predetermined distance. The speed-control mechanism functions in such manner that if the speed is not reduced by the engineer in accordance with a gradually reducing or tapered speed-control limit, the brakes become applied automatically and cannot be released until the speed at that particular point has been reduced below the limit fixed by the mechanism. Failure to acknowledge results in an automatic brake application, which cannot be released until the speed of the train has been reduced to approximately 7 miles per hour. When the train is being operated under the low-speed restriction of 23 miles per hour, the acknowledging indicator sounds and recurrent acknowledgment is required at intervals of approximately 4,200 feet to prevent an automatic-brake application. If the low-speed limit is exceeded in a restricted zone, an automatic-brake application is initiated and the brakes cannot be released until the speed has been reduced to 23 miles per hour. When the restriction is removed the visual indicator changes from red-over-yellow to green, and a single stroke on a gong located in the cab is sounded. Then the train may be operated at maximum authorized speed.

A train-control automatic-brake application is effected by means of a brake-valve actuator, which is superimposed upon the brake-valve housing. The actuator has a cut-out cock, the handle

of which normally is locked in the cut-in position and sealed. The key for the lock of the cut-out cock cannot be removed unless the automatic train control is cut in. This key is required to be in the possession of the conductor during the trip, and a duplicate key is provided in a sealed box located in the engine cab. The actuator can be cut out after the lock is unlocked or the seal is broken.

The entrance to block 391, the block involved in the accident, is located 5,171 feet east of the point where the accident occurred. With block 391 occupied, there is an approach section extending eastward a distance of 7,969 feet to the entrance to block 389, in which a train-control restriction is imposed. As a result, a restricted zone extending 13,140 feet east of the point of accident is provided.

Operating rules read in part as follows

35. The following signals will be used by flagmen

Day signals--A red flag,
Torpedoes and
fuses.

* * *

86a. In automatic train control districts an inferior train must be clear of the main track in time so that a following first-class train will not receive a restrictive indication.

99. * * *

When a train is moving under circumstances in which it may be overtaken by another train, the flagman must take such action as may be necessary to insure full protection. By night, or by day when the view is obscured, lighted fuses must be thrown off at proper intervals.

* * *

Instructions relating to operation in automatic train-control territory provide in part as follows

The train control device, or any part of it must not be CUT CUT unless it is unworkable. * * *

Aspects and indications of the visual indicator are as follows

<u>Aspect</u>	<u>Indication</u>
Green	Proceed
Red-over-yellow	Proceed at not exceeding Maximum Low Speed

Maximum low speed for the trains involved is 23 miles per hour. Under the rules a train moving under a slow-speed restriction must be operated prepared to stop short of a train or obstruction. The maximum authorized speed for an express-mail train is 70 miles per hour, and for freight trains, 50 miles per hour.

Description of Accident

Extra 4006 West, a west-bound freight train, consisted of engine 4006, 53 loaded cars, 1 empty car and a caboose. This train departed from Missouri Valley, 21.4 miles east of Council Bluffs and the last open office, at 8 45 a. m., according to the dispatcher's record of movement of trains, and while moving at an estimated speed of 15 to 18 miles per hour it was struck by No. 5 at a point 5,171 feet west of the entrance to block 391.

No. 5, a west-bound first-class express-mail train, consisted of engines 1637 and 2906, 5 express cars and 2 mail cars, in the order named. The fifth and seventh cars were of steel-underframe construction and the remainder were of all-steel construction. This train departed from Missouri Valley at 9 11 a. m., according to the dispatcher's record of movement of trains, 1 hour 2 minutes late, proceeded through block 329 and into block 391 to the point of accident without material reduction of speed, and while moving at an estimated speed of 60 miles per hour it collided with Extra 4006 West.

The caboose and the rear three cars of Extra 4006 West were demolished. The fourth and the eleventh cars ahead of the caboose were slightly damaged. Both engines of No. 5 were derailed and badly damaged. Engine 1637 stopped on its right side across both main tracks 251 feet west of the point of impact. Engine 2906 stopped upright across both main tracks and behind engine 1637. The first three cars were derailed and damaged.

Parts of the automatic train-control equipment consisting of the train-control receivers, turbo-generator, wiring on the engine, wiring between the engine and tender, and the governor drive shaft were damaged in the collision. The mechanism case containing the amplifier, relays and speed-control mechanism was undamaged.

It was clear at the time of the accident, which occurred about 9:25 a. m.

The train-service employees injured were the engineer and the fireman of the first engine, and the fireman of the second engine of No. 5.

Discussion

The rules governing operation on the line involved provide that when a train is moving under circumstances in which it may be overtaken by another train the engineer must take such action as may be necessary to insure full protection. During the day-time when the view is obscured, lighted fusees must be thrown off

at proper intervals. In automatic train-control territory, an inferior train must be clear of the main track in time so that a following first-class train will not receive a restrictive indication. The automatic train-control device, or any part of it, must not be cut out unless it is unworkable. A train moving under a restrictive indication must be operated in accordance with predetermined speed restrictions enforced by the device, and must be prepared to stop short of a train or obstruction.

Extra 4006 west was moving at a speed of about 18 miles per hour when struck by No. 5. Under the rules, Extra 4006 was required to clear the time of No. 5, or provide flag protection. The crew of Extra 4006 understood these requirements, but they had received oral information from the train dispatcher that No. 5 was about 1 hour late, and their train was proceeding on the time of No. 5, in accordance with the common practice under these conditions. This is a dangerous practice and not in accordance with the rules of the carrier. Under the circumstances the crew of the preceding train were expecting No. 5 to be not less than 1 hour late, but the movement of No. 5 was not restricted by train order and this train passed the last station east of the point of accident, where time is shown, only about 56 minutes late. The conductor and the flagman of Extra 4006 were in the caboose. The flagman said he did not provide flag protection because he was depending upon the automatic train-control system to restrict the speed of No. 5. If Extra 4006 had cleared the time of No. 5 in accordance with the rules, or if flag protection had been provided for Extra 4006 while it was proceeding on the time of No. 5, or if a train order authorizing Extra 4006 to proceed on the time of No. 5 had been issued, this accident would have been averted.

As No. 5 was approaching the point where the accident occurred the speed was about 70 miles per hour. The train air-brake system was in the charge of the engineer of the first engine. The engineer of the first engine was maintaining a lookout ahead and the fireman was adjusting the injector. The first they knew of anything being wrong was when the engineer saw the caboose of the preceding train at a distance of about 1,200 feet. He immediately moved the brake valve to emergency position, but the speed of No. 5 was reduced only to about 60 miles per hour at the time of the collision. The automatic train-control apparatus of engine 1637 and the brakes of No. 5 had been tested at the initial terminal. The brakes functioned properly at all points where used en route. The engineer of engine 1637 said the visual indicator displayed green when his train departed from Missouri Valley and until the accident occurred. The fireman said that when the brakes were applied just before the accident occurred the visual indicator displayed green. No warning was sounded by the audible indicators. The actuator cut-out cock was in its proper position and the seal was intact when the fireman last observed it at Missouri Valley. The engineer said the levers and switches of the automatic train-control apparatus were in proper position throughout the trip. The key of the actuator cut-out cock was in the possession of the conductor. The enginemen of the second engine said the first they knew of anything being wrong was when the brakes were applied in emergency.

Several hours after the accident occurred, the supervisor of automatic train-control examined engine 1637 and found that the actuator cut-out cock seal was missing but the cut-out cock was in cut-in position. The seal was not found, and it was not determined if the seal was broken as a result of the accident or if it was removed before or after the accident occurred.

The visual indicator of engine 1637 should have displayed red-over-yellow throughout a distance of at least 13,140 feet in approach of the point of accident, and the speed-control mechanism should have operated throughout this distance. If the speed-control mechanism had operated as intended, both audible indicators would have sounded, the speed of No. 5 would have been controlled by either the engineer or an automatic-brake application, and the speed at the point of accident could not have been greater than 23 miles per hour. However, the speed was about 60 miles per hour at the time of the accident, the visual indicator displayed green up to the time of collision and neither audible indicator sounded. Prior to this time nothing unusual had occurred to indicate that the automatic train-control apparatus was not functioning.

After the accident extensive tests of both the wayside apparatus and the locomotive equipment were made in an effort to discover any condition which could have caused the failure of the automatic train-control system to perform its intended functions under restrictive conditions. In these tests all apparatus and each circuit of the wayside equipment functioned as intended, and no condition was disclosed that might have caused improper operation. Tests of the undamaged parts of the locomotive equipment disclosed one condition that could have caused or contributed to the cause of the failure of the automatic train-control system to function properly. The front wheels of the engine truck of engine 1637 were found to be sufficiently magnetized to produce substantial voltages in the receiver circuit. Because of the axle being bent and the treads of the wheels being damaged in the accident, the wheels were mounted on another axle and the treads were machined to proper contour. This assembly was placed in another engine upon which the mechanism case containing the train-control equipment from engine 1637 was installed. To determine if the magnetized wheels could have caused the improper operation of the automatic train-control equipment on engine 1637, tests were made in which speeds between 70 and 75 miles per hour were attained. The voltages induced in the receiver coils by the rotating magnetic fields of the wheels resulted in a current in each winding of the primary relay which was at least equal to that required for the relay to pick up, but these currents, although of sufficient magnitude, apparently either were not of the right frequency or did not have the proper phase relation to cause the primary relay to operate, and a green indication was not displayed, however, the relative positions of the wheels after they were pressed on another axle probably were not the same as those on engine 1637, and a different disposition of the magnetic poles on one wheel with relation to those on the other might cause such improper operation.

The tests disclosed also that the pick-up value for the electrical equipment on engine 1657 was somewhat low. This condition would cause the equipment to be more susceptible to improper operation from such causes as foreign current in the rails or induced voltage in the receivers from magnetized wheels, power transmission lines and other magnetic fields. The low pick-up value may have been a contributing factor in causing the improper operation of the automatic train-control system. The pick-up value must be materially increased.

In the territory involved there are no wayside signals except at interlockings. If automatic block-signals in connection with the automatic train-control system had been in use and the cause of the failure of the automatic train-control system was confined to the locomotive equipment, the wayside signals would have displayed aspects indicating that the preceding train was a short distance ahead, and this accident would have been avoided.

Findings

It is found that (a) the cause of this accident was the failure of the automatic train-control system to function as intended, and (b) the operating rules were not enforced and obeyed.

Recommendations

It is recommended that (a) wayside signals be installed in connection with the automatic train-control system on this line, (b) cab signals conforming to specifications and requirements prescribed by the Commission's order of April 13, 1939, be installed on locomotives of this carrier in connection with the automatic train-control system, and (c) operating rules be enforced and obeyed.

Dated at Washington, D. C., this twelfth day of March, 1947.

By the Commission, Commissioner Patterson.

(SEAL)

W. P. LUTZ,

Secretary.